

If you double the x -value from 3 to 6 or from 6 to 12, the corresponding y -values are multiplied by 8, or 2^3 . You can see algebraically why this is true.

$$h(6) = 5 \cdot 6^3$$

$$= 5(3 \cdot 2)^3$$

Write the x -value 6 as twice 3.

$$= (5 \cdot 3^3) \cdot 2^3$$

Distribute the exponent over multiplication and then associate.

$$= h(3) \cdot 8$$

In conclusion, if you multiply the x -values by 2, the corresponding y -values are multiplied by 8. This is called the **multiply–multiply property** of power functions. Note that extra points may appear in the table, such as (9, 3645) in Figure 2-3c. They do belong to the function, but the x -values do not fit the “multiply” pattern.

In this exploration, you’ll find patterns for the y -values in quadratic functions similar to the add–add property of linear functions.

EXPLORATION 2-3: Patterns for Quadratic Functions

1. Show by making a table on your grapher that the points in the table fit the quadratic function

$$q(x) = 0.2x^2 - 1.3x + 14$$

x	$q(x)$
2	12.2
4	12.0
6	13.4
8	16.4
10	21.0

2. Find the differences between consecutive y -values. Then find the *second differences*, that is, the differences between the consecutive differences. What do you notice?
3. Recall that the general equation of a quadratic function is $y = ax^2 + bx + c$, where a , b , and c stand for constants. Substitute the first three ordered pairs from the table in Problem 1 to get three linear equations involving a , b , and c . Solve this system of equations using matrices. Write the particular equation. Does it agree with the equation in Problem 1?

4. On the same screen, plot the graph of $q(x)$ and the five data points. You may use the stat feature on your grapher. Sketch the result.
5. Trace the graph of $q(x)$ to each value of x in the table. Do the five points lie on the graph?
6. Show that a quadratic function fits the data in this table by finding second differences. Find the particular equation, and show that these values satisfy the equation.

x	$f(x)$
1	12.3
4	34.8
7	44.7
10	42.0
13	26.7

7. What did you learn as a result of doing this exploration that you did not know before?